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WATER POLLUTION CONTROL 1969-1973. THE FEDERAL COSTS. A REPORT TO THE CONGRESS

Federal Water Pollution Control Administration
Washington, D. C.

January 1968

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A Report to the Congress

WATER POLLUTION CONTROL

1969-1973

THE FEDERAL COSTS

U. S. Department of the Interior
Federal Water Pollution Control Administration
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INTRODUCTION

There can be no substitute for clean water. Yet pollution for too long, has been increasing its threat to the Nation's lakes, streams and aquifers--even to the ocean waters around us. The people of the United States now realize that polluted water affects us all.

They have mounted a massive effort to combat pollution and assure clean waters for the future. Reflecting the rising public concern--the urgency to correct and control pollution--Congress has enacted two major pieces of legislation. The Water Quality Act of 1965 and the Water Restoration Act of 1966 greatly strengthened the Federal Government's ability to launch a concerted nationwide attack, so badly needed to save our water resources.

As thus amended, the Federal Water Pollution Control Act provides a broad range of tools, including research, enforcement, technical and financial assistance, comprehensive basin planning, and the training of manpower. It enlists the participation of State and interstate agencies, municipalities, industries, universities, and individuals. The success of the national program depends upon the skilled and effective use of these tools.

During its two years' existence, the Federal Water Pollution Control Administration has begun to implement the 1965 and 1966 amendments and has continued the programs that were already underway.

Section 16(a) of the Federal Water Pollution Control Act, directs the Secretary of the Interior to "make a detailed estimate of the cost of carrying out the provisions of this Act" and to "submit such detailed estimate...for the 5-year period beginning July 1, 1967, to Congress no later than January 10, 1968...." The estimate is to be updated annually.

This report outlines an optimum program to meet the Nation's pollution control needs over the next five years.

During those years, the major thrust will be the cooperative Federal-State effort to implement water quality standards and attain adequate municipal and industrial waste treatment. The FWPCA will also develop, test, and demonstrate new technology to solve present and avert future pollution problems. The training of adequate manpower to operate the waste treatment facilities is crucial to the success of the whole anti-pollution effort. Program activity will be directed increasingly toward water quality control for entire river basins.

The estimates given here represent FWPCA's best thinking at the start of 1968. At the same time, the uncertainties of the future are nowhere more apparent than in this fast-moving field. Moreover, other factors will also affect the thrust and level of expenditures for pollution control. Some of these uncertainties and other factors that will affect the level of effort in the clean water program include:

(1) Better information on national needs.

Federal expenditures should be governed in large part by contemporary assessments of national needs, and we are moving rapidly to improve our understanding and ability to measure them. A companion report to this one, "The Cost of Clean Water", identifies requirements for waste treatment facility construction and estimates the costs to be incurred by municipalities, industries, and others in future years in meeting the requirements. Through the development of water quality standards and State and interstate agency program plans, we are gaining better information on associated programs and needs. The knowledge so developed will contribute significantly to future Federal programming. Information will be refined, improved, and updated annually, and may significantly affect the future costs of carrying out the Act.

(2) New problems.

Despite the best long-range thinking that can now be applied, we will continue to encounter new problems to be solved and controlled. We need only look at situations like the Torrey Canyon oil tanker disaster to recognize this. The proliferation of exotic chemicals produced, the persistence of man-made and natural soil erosion, the subsurface disposal of wastes with consequent groundwater pollution, pollution from animal feed lots in new locations, dredging and dredged material disposal, thermal pollution, all represent new or previously unrecognized pollution problems whose control is necessary in the context of today's accelerated clean up.

We must be alert to potential problems and ready to prevent them before they occur. Leaching and erosion of mine and mill tailings is a problem of unspecified magnitude. For example, we must be mindful of the possibility of commercial processing of oil shale and associated minerals in the Colorado River Basin within the next decade. Much more needs to be known about the nature and extent of the potential water pollution problems associated with oil shale development. Past experience in the mining and milling industry has demonstrated that, to avert water pollution, pollution control must be developed as part of the production technology. To stop such pollution before it starts, and to avoid the errors of the past, FWPCA is actively participating in consideration of oil shale development within the Department of the Interior.

(3) Development of new programs.

Some programs, such as water quality standards and State-local basin planning grants, are just now in their early stages. Their development will involve new methods. Indeed, to be effective, the whole national pollution control effort must continue to

seek out new approaches to resolve existing and new problems. These will no doubt call for modifications in the cost estimates.

(4) New legislation.

Some new programs may be enacted into legislation, significantly revamping current cost estimates. Already, the Senate has passed S. 2760, calling for accelerated research in lake pollution and acid mine drainage, and increasing the authorities to cope with oil pollution. Administration bills, S. 2525 and H.R. 13923, have been introduced, to control pollution from boats and vessels. As such legislative changes occur, they will have a significant impact upon the Federal program. This report makes no attempt to take potential legislative changes into account in arriving at the cost estimates.

(5) The role of related programs and other levels of government.

There is a complex of interrelated effort in Federal agencies and programs which can help achieve the objectives of water pollution control. For example, the Departments of Labor and of Health, Education, and Welfare can assist in the training of sewage treatment plant operators, thus lessening the FWPCA costs for this item. The U. S. Geological Survey can contribute basic hydrologic data to help monitor water quality standards, reducing the FWPCA budget requirements in this respect. Remote sensors, such as the EROS satellite, a cooperative venture supported by NASA, TVA, and the Departments of the Interior and of Agriculture, may contribute to the surveillance of heat, oil, and othe types of pollution. These complementary approaches with other Federal agencies will be developed and may have significant impacts upon future FWPCA budgets. There is encouraging evidence of increased efforts by State and local governments in response to the strengthened Federal

effort to control pollution. As these stronger activities increase, they will in turn directly affect the shape and nature of Federal program activities. For example, the water quality standards established under the Water Quality Act of 1965 will generate new and strengthened relationships among Federal, State, municipal, and industrial entities in the whole area of water quality monitoring.

(6) Changing relationships among various components of the Federal Water Pollution Control program.

The costs are presented by individual sections of the Act. However, implementing the Act is a highly integrated process. Enforcement (Section 10) may depend on data gathered (Section 5) by the pollution surveillance program. Execution of Section 11 regarding pollution control from Federal installations may rely heavily on technical assistance supported under Section 5 or on basin planning supported under Section 3. A major management objective of the FWPCA is to strengthen this type of program integration. Thus, in striving for flexible utilization of all resources to carry out the Act, subsequent reports may depart somewhat from the distribution pattern presented here.

(7) Constraints, priorities, and fiscal conditions.

The costs presented herein represent an optimum effort to meet our pollution control needs. Obviously, other factors will have a significant effect on the level of funds actually requested each year. Manpower shortages--Federal, State, and local--could affect program expansion. With regard to the treatment works program, a number of factors such as conditions in capital markets and the construction industry, and ability of States and localities to gear up to significantly higher levels of construction activity could change annual estimates. Priorities within the Department of the Interior and the overall Federal Budget may also change the level of expenditure by years. Finally, overall budgetary and fiscal policy will certainly have an effect on the timing of expenditures.

SUMMARY

The Federal Water Pollution Control program is evolving rapidly as a dynamic force in resource conservation. New legislation and new programs could effect major changes in its direction and magnitude. In retrospect, it is difficult to envision any prediction in 1962 of the present FWPCA program and costs. Different stages of development and thinking, in technology, in recognition of needs, all render our estimates tentative. As of January 1968, this report sets forth the best thinking as to the action needed under existing authorities for an optimum program for attacking water pollution, together with some suggested new authorities. There is a pressing need to move foward with the elements of the program described herein. These elements are:

(1) A waste treatment facilities construction grant program designed to assist communities in accelerating the control of municipal pollution.

(2) Stimulation and support of State and interstate water pollution control agencies through grants for strengthening their programs.

(3) Establishment and maintenance of water quality standards throughout the nation to enhance the quality and productivity of its water resources in an orderly, programmed manner.

(4) Prompt and effective enforcement, when necessary to assure conformance with water quality standards to protect the health or welfare of persons endangered by pollution and to cause abatement of pollution which makes shellfish unmarketable.

(5) A vastly increased training effort with particular attention to stimulation of waste treatment plant operator training, and professional and technical training grant programs, to meet the rapidly growing demand for skilled manpower.

(6) An accelerated research effort with strong emphasis on demonstration, involving in-house activity as well as contracts and grants to industry, public agencies, and universities in order to develop improved or new techniques to combat water pollution.

(7) Increased capability to provide technical assistance to State and Federal agencies, communities, and industries to help them to apply up-to-date technology to the solution of difficult problems.

(8) Effective pollution control planning coordinated with other agencies, with emphasis on river basin-wide planning.

(9) Development of a rapidly responding water pollution surveillance system in conjunction with States and other agencies to monitor compliance with water quality standards.

(10) Federal leadership in abatement and control of water pollution from its own installations and activities.

(11) Expansion of field laboratories to support research, technical assistance, training, and surveillance.

(12) A variety of recurring and special studies providing data and conclusions to give new direction and implementation to existing and future programs.

Costs are shown in Table I. These estimates cover only FWPCA's effort in carrying out the provisions of the Act. There are other departments, bureaus and offices in the Federal Government which also contribute to the pollution abatement effort. Their significant contributions are not included in these estimates since they fall outside the provisions of the Act.

TABLE I

COST OF CARRYING OUT THE FEDERAL WATER POLLUTION CONTROL ACT

($ Thousands)

SHORT TITLE	Sec. of the Act	FY 1969	FY 1970	FY 1971	FY 1972	FY 1973	TOTAL
Comprehensive Programs	3a	8,033	10,000	10,000	10,000	9,000	47,033
Water Quality Control Thru Stream Flow Regulation (1)	3b						
Grants to Non-Federal Water Pollution Control Planning Agencies	3c	2,000	3,000	4,000	5,000	6,000	20,000
Interstate Cooperation and Uniform Laws (2)	4						
Training (3)	5a	5,409	8,000*	9,000*	11,500*	13,500*	47,409
Technical Assistance	5a + b	3,561	5,000*	7,500*	9,500*	11,000*	36,561
Collection and Dissemination of Data	5c	2,330	5,000*	8,000*	11,000*	14,000*	40,330
Research, Development and Demonstration	5a + d	28,002	45,000*	50,000*	50,000*	50,000*	223,002
Field Laboratory and Research Facilities	5e		8,300*	9,000*	2,000*	1,400*	20,700
Great Lakes Water Quality (4)	5f						
Estuarine Study	5g	1,000	1,000*				2,000
Grants for Research and Development	6a + b	28,000	60,000*	60,000*	50,000*	60,000*	258,000
Grants for Water Pollution Control Programs	7	10,000	10,000	10,000	10,000*	10,000*	50,000
Grants for Construction (5)	8	225,000	1,000,000	1,250,000(6)	*	*	2,475,000
Grants Administration		2,667	4,400	5,300			12,367
Water Pollution Control Advisory Board (7)	9						
Enforcement	10d-k	3,498	5,000	5,000	5,000	5,000	23,498
Water Quality Standards	10c	729	1,000	1,000	1,000	1,000	4,729
Federal Activities	11	758	1,200	1,400	1,400	1,400	6,158
Administration	12	5,246	5,900	6,200	6,500	6,800	30,646
Cost Estimate Studies	16a	202	300	300	300	300	1,402
Manpower and Training Study (8)	16b						
Wastes from Watercraft (8)	17						
Industrial Incentives (8)	18						
TOTAL		326,435	1,173,100	1,436,700	183,200 (9)	189,400 (9)	3,308,835 (9)

1/ $700,000 per year included in Section 3(a)
2/ Costs distributed in Sections 3, 7, and 10.
3/ Includes training of FWPCA employees under Government Employees Training Act - P.L. 85-507
4/ Included in Sections 3, 5(b), (c), (d) and 10(c)
5/ Includes cost of administering construction grants
6/ Authorized levels. Does not consider alternate financing proposals.
7/ $90,000 per year included in Section 12.
8/ Studies completed - no further costs without further legislation.
9/ Construction Grants not shown for FYs 1972 and 1973

*Extension of current authorizations required.

DECLARATION OF POLICY

(SECTION 1, FEDERAL WATER POLLUTION CONTROL ACT)

Section 1 of the Federal Water Pollution Control Act establishes a national policy for the prevention, control, and abatement of water pollution. It vests in the Secretary of the Interior the responsibility for implementing the Act through an Administration created by Section 2, and provides him an Assistant Secretary, who assists in the discharge of the Secretary's duties with respect to administering the Act. The Assistant Secretary, so named presently, provides secretarial direction and supervision for both the Federal Water Pollution Control Administration and the Office of Saline Water.*

COMPREHENSIVE PROGRAMS FOR WATER POLLUTION CONTROL

(SECTION 3, FEDERAL WATER POLLUTION CONTROL ACT)

Effective river basin planning and comprehensive approaches to pollution control are essential to assure optimum returns from the massive investment needed to abate pollution. The various subsections of Section 3 authorize the necessary planning and program development to achieve pollution control through the river basin approach.

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*This office is funded as a part of the overall costs of the Office of the Secretary of the Interior, rather than through the Federal Water Pollution Control Administration Budget. Costs are not included in this report. Sections 2, 13, 14, 15 and 19 of the Act also engender no costs directly associated with identifiable program activities and therefore are not discussed. Costs related to the Oil Pollution Act, 1924, appear in activities covered in Sections 5 and 10.

Comprehensive Programs

Section 3(a)

This subsection directs the development of comprehensive water pollution control programs. The FWPCA has established comprehensive projects in various major river basins and regions for this purpose. As of FY 1968, 16 such projects were in operation, covering 78 percent of the United States land area and 96 percent of its population.

These projects develop pollution control action programs for river basins on the basis of projected water needs and problems. Through the use of the scientific, engineering, and economic data that the projects provide, FWPCA is able to delineate present problems, to anticipate future problems, and to devise a comprehensive approach toward their solution. To this end, FWPCA has compiled information indicating the major immediate needs for pollution control in most of the nation's river basins. The comprehensive projects also have been a principal source of information, together with the States themselves, for the establishment of water quality standards in accordance with Section 10 of the Act.

Both will provide information on which to base standards revisions in the future. They have also been the nucleus for FWPCA participation in interagency river basin planning as coordinated through the Water Resources Council. This participation assures that quality control considerations enter into the overall pattern of water resource development.

Water Quality standards as established under Section 10 of the Act provide the formal goals and objectives for basinwide clean up, heretofore lacking. The standards include compliance plans and timetables for the control of existing pollution, a major step toward effective regional control. Planning emphasis will now be on the longer range considerations, on the problems which must be anticipated if we are to control pollution in the years ahead. These are complex issues involving basinwide water management and development on a regional basis. They will

involve a variety of efforts such as forecasting the long-term effects of temperature increases from future thermal electric generation in the Columbia River Basin, and developing basin-wide temperature controls; and studying the long-term effects of agricultural pollutants in San Francisco Bay and recommending means for control. The long range issues will also involve participation and coordination with the interstate compact groups and increasing numbers of other regional organizations.

Many, but not all, of these activities will be performed in association with the basin planning activities now being coordinated by the Water Resources Council. This will include full participation with the other Federal agencies concerned in completing, by 1972, framework plans for the development of water and related land resources in the 18 major river basins of the United States. FWPCA's participation will assure that pollution control is built into these plans.

The costs for comprehensive water pollution control planning and programs for FY 1969-1973 appear below. They include, in addition to direct planning activities authorized by this subsection, the costs for administering subsection 3(b) and the grant programs under subsection 3(c) and Section 7. These are combined here because of the relatively small amounts involved and the integrated manner in which the mutually supporting efforts are carried out.

	COSTS (Thousands)
FY 1969	$ 8,033
1970	10,000
1971	10,000
1972	10,000
1973	9,000
TOTAL	$ 47,033

Water Quality Control Through Storage for Streamflow Regulation

Section 3(b)

Section 3(b) requires that storage for regulating streamflow for the control of water quality be considered in the planning of Federal reservoirs. The need for such storage is determined by the constructing agency with the advice of the Secretary of the Interior. Executive Order 11288 supplements this statutory directive by establishing a procedure for the drafting and review of construction plans for Federal water resources development projects.

Pursuant to these provisions, FWPCA reviews the plans of the Federal water resources development agencies to determine the future impact on water quality. When appropriate, additional storage for streamflow regulation for water quality control as well as other project modifications is recommended. Since Section 3(b) was added to the Act in 1961, FWPCA has made 287 reports to Federal construction agencies assessing the need for and value of such storage. Water storage for quality control was recommended in 104 of these reports.

Streamflow regulation is, of course, only one tool for pollution control and water quality management, and the law delineates adequate treatment of municipal and industrial wastes before they enter streams as the basic first step in pollution control. However, in many instances, waste treatment or other methods of waste control at their source will not be sufficient to attain desired stream quality over the long run. In these cases, storing water in Federal reservoirs for flow regulation is a useful and often essential means of water quality control.

Although the need for streamflow augmentation is generally recognized and many reservoir studies and recommendations have been made towards this end, significant difficulties are emerging in providing the necessary augmentation. Existing patterns of water use, in many cases, are not adequate

to assure that water stored for water quality control purposes can be managed effectively to accomplish that end. Improved techniques must be developed to assure that flow regulation can be used effectively in conjunction with other controls and treatment facilities.

There is also the question of who should pay for the inclusion of water quality control storage in a Federal reservoir. Section 3(b) provides that if the benefits from such storage are widespread or national in scope, the Federal Government will pay 100 percent of the cost. From the 1961 amendments to 1967, if adequate treatment was being given to municipal and industrial wastes, storage for flow regulation was regarded as a national benefit and thus was provided entirely at Federal expense. However, the interpretation of benefits as "widespread or national in scope" has proved troublesome, when considered in relation to other Acts governing water resource projects, such as the Water Supply Act of 1958 and the Federal Water Project Recreation Act.

In light of new concepts of the best practical waste treatment methods, and increased Federal support for the construction of treatment facilities, flow regulation storage should now be considered as a valid alternative method of quality control only when existing treatment is at the best practicable economic and technical level. As a result, the Secretary of the Interior has proposed a new policy on "Reservoir Storage and Releases for Flow Regulation for Quality Control." The policy sets forth a new method for computing benefits for the water quality functions of a multipurpose reservoir, dividing the costs of the water quality control feature between the Federal Government and the affected State, interstate, or other non-Federal public entities.

FWPCA is studying the feasibility of applying the new policy to as yet unauthorized reservoir projects previously considered under the old method of computation. Under the new policy, FWPCA would review proposed Federal reservoirs with greater emphasis on improved planning, such as the application of hydrologic models and estimating procedures, improved consideration of alternatives, and on the actual implementation of streamflow regulation as a supplement to water quality management.

The matter of developing more effective policies for utilizing streamflow regulations in water quality control programs is also currently under review by the Water Resources Council. However, in the final analysis, full and effective implementation of this technology may require changes in existing legislation.

The estimated costs for FYs 1969-1973 are for providing personnel to work with the Federal construction agencies and the appropriate non-Federal entities in determining streamflow regulation needs. These costs are projected at $700,000 per year for FY 1969-1973 and are included in the total under Section 3(a).

Grants to Non-Federal Water Pollution Control Planning Agencies

Section 3(c)

This is a new program authorized by the Clean Water Restoration Act of 1966. Hopefully these grants will stimulate the kind of State-local planning so important to implementing and improving water quality standards and will lead to the formation of permanent arrangements for coordinated river basin water quality management.

As an illustration, joint or coordinated waste disposal systems serving municipalities, industries and others offer substantial economies of size and provide opportunities for more effective and efficient pollution control through unified treatment and disposal. Shared costs should be less than for individual treatment. However, although the engineering technology is available, there are organizational and political problems which create institutional barriers. A first step is to get communities, industries and regional economies to plan together. This provision of the Act offers great opportunities, over the long run, to stimulate this type of cooperation to achieve a greater measure of pollution control.

Section 3(c) authorizes grants to non-Federal agencies to support effective, comprehensive water quality control and pollution abatement planning for river basins. The grant may not exceed 50 percent of the planning agency's administrative expenses for not more than three years.

The planning grant program is currently in the early stages of development. The first appropriation under the 1966 authorization was $500,000 for FY 1968. To assist prospective grantees, FWPCA has prepared and distributed "Guidelines for Grants--Comprehensive River Basin Planning" to State, local, and interstate pollution control agencies. These assert that the basic purpose of a pollution control plan is to (1) serve as a guide for effective action to eliminate and control pollution throughout interstate or intrastate basins; and (2) provide permanent basinwide water quality management programs which involve joint efforts of State, local, and metropolitan bodies as well as private interests. An essential feature of a basin plan is the action program which sets forth financial arrangements and an appropriate institutional framework through which States and local communities can coordinate their efforts to control pollution in the basin on a continuing basis.

The planning grants could prove to be a vital catalyst in stimulating State-local efforts to develop comprehensive basinwide pollution control programs. However, at this early stage the program's future dimensions are somewhat uncertain. Experience with this type of grant during the next few years should clarify future needs.

The costs for administering this grant program were counted under Section 3(a). They attach largely to providing personnel to work with the grantee agencies, helping them develop the most effective program plans. Certain grant processing costs are also involved.

The estimated costs of the grants themselves for FY 1969-1973, set out below, are based upon current assumptions as to the likely response of State and local planning agencies. It

is anticipated that effective participation in the program will grow steadily during this period.

	COSTS (Thousands)
FY 1969	$ 2,000
1970	3,000
1971	4,000
1972	5,000
1973	6,000
TOTAL	$20,000

INTERSTATE COOPERATION AND UNIFORM LAWS

(SECTION 4, FEDERAL WATER POLLUTION CONTROL ACT)

The States have a large measure of responsibility for controlling water pollution, and it is important that their efforts be closely related to each other if maximum results are to be achieved. Accordingly, Section 4 directs the Secretary of the Interior to encourage cooperative efforts among States, uniform State laws, and interstate compacts for preventing and controlling water pollution.

All the FWPCA programs, in varying degrees, encourage such cooperation among the State water pollution control agencies. But often there is need for a still more formal coordination. Thus, several interstate pollution control agencies with varying degrees of program responsibility have come into being through the interstate compact device. Two notable examples are the Ohio River Valley Water Sanitation Commission and the Delaware River Basin Commission, which has Federal as well as State representation. New ones are being considered currently for the Potomac and Susquehanna River systems, among others.

Pursuant to this section, FWPCA has developed knowledge concerning the strengths and weaknesses of various alternative interstate arrangements. Through processes of reviewing, advising and assisting, FWPCA helps the States, the existing interstate agencies, and other parts of the Federal Government, to determine what is necessary, desirable and workable in interstate organizations.

Uniformity in State anti-pollution laws also contributes to an effective nationwide attack on unsatisfactory water quality. A suggested State water pollution control law has been in existence since 1950. At the end of 1965, the laws of approximately three-fourths of the States included all or parts of its provisions. In that year, a revised version was developed in cooperation with the Association of State and Interstate Water Pollution Control Administrators. The

current issue was in response to the accelerated national drive to end water pollution and was designed to strengthen the capacity of States to act effectively. Already the updated suggested law has been used by many States to improve their pollution control statutes.

FWPCA will continue advising and assisting the States in developing such uniformity as new needs and requirements evolve. This will include new changes in Federal laws which call for compatible State responses.

The functions defined by this section are carried out in a number of ways by several parts of FWPCA. Costs cannot be isolated realistically; rather they are incorporated elsewhere, particularly under Sections 3, 7 and 10.

RESEARCH, INVESTIGATIONS, TRAINING AND INFORMATION

(SECTION 5, FEDERAL WATER POLLUTION CONTROL ACT)

Solving the technical problems in pollution control demands a sound base of scientific and engineering knowledge and skilled manpower to apply that knowledge. Section 5 authorizes a variety of activities, including research, field demonstrations, training, data collection, laboratories, and technical assistance--all essential to technical and scientific leadership in the control of water pollution.

Section 5(h) of the Act, added by the Clean Water Restoration Act of 1966, authorized $60 million for FY 1968 and $65 million for FY 1969 to carry out Section 5 activities, except for a study of estuarine pollution. Due to budgetary constraints, the actual appropriations for FYs 1968 and 1969 were short of the authorized levels.

The funding authorizations expire on June 30, 1969. The Department will propose legislation to extend them early in this session of the 90th Congress. However, the cost

estimates here projected are based on program needs, rather than on assumed authorizations for the years 1970-1973.

Training

Section 5(a)

Over the long run the lack of adequately trained manpower could well prove to be the "Achilles heel" of the national water pollution control effort. Substantial expenditures for construction grants, research and development, river basin planning, technical assistance and similar endeavors are proposed in various sections of this report. The effective utilization of these funds and the nature of the changes they create depend largely on adequate staffs of skilled people, from treatment plant operator to research scientist. The need to develop new treatment techniques and the accelerated water pollution control activity at Federal, State, and local levels, in industry and elsewhere, makes training a prime program requisite. Training at all levels must, therefore, become a major program thrust for FWPCA. A number of new approaches are being explored. Hopefully the next five years will be a period of vastly accelerated effort and accomplishment.

If operator training needs are not met, the public may expect an unsatisfactory return on clean water investment because of inefficiently operated waste treatment plants. Present State training facilities and programs are generally inadequate in both quantity and quality to meet even the current needs. Thus, a major effort, supporting States through grants under Section 7, experimenting with new training techniques, and exploring new channels for training, will be fundamental in FWPCA's forthcoming program.

The report, "Manpower and Training Needs in Water Pollution Control" (Senate Document No. 49, 90th Congress, 1st Session), submitted to the Congress by FWPCA in accordance with Section 16(b) of the Act, estimates the total manpower now involved in water pollution control (professionals, technicians and

treatment plant operators for public and private agencies) at about 45,000 persons. By further projecting the report's FY 1972 figures, the manpower needs in FY 1973 can be estimated at 135,000, an increase of 90,000 over FY 1967. The objectives of the FWPCA training programs authorized under Section 5(a)(2), (4), and (5) are to encourage, cooperate with, and assist appropriate agencies, institutions, and individuals in the conduct of specialized training relating to the cause, control, and prevention of water pollution. The programs are designed to provide adequately trained and motivated professional and subprofessional manpower for scientific, administrative, and technical positions in water pollution control. They must effect a threefold growth in personnel over the next five years.

FWPCA is pursuing a number of training approaches: technical training, both in-house and through the grants device; interagency training; professional training through grants and research fellowships.

Specialized and advanced technical training is offered to personnel of FWPCA and other public agencies at all levels, as well as private agencies and institutions. Such training is conducted in the FWPCA field laboratories and at the Robert A. Taft Sanitary Engineering Center in Cincinnati for new recruits in water pollution control and for experienced personnel in need of refresher courses. The curriculum includes technical courses of one and two weeks' duration, usually at the postgraduate level, broad courses in water quality management for senior technical and administrative personnel, orientation courses designed to meet the needs of particular State and local agencies or academic institutions, and technical seminars led by government and industry experts from the United States and foreign countries. FWPCA laboratory personnel also provide technical guidance to States, universities, and other entities offering similar courses. In FY 1967 some 50 of these short-term courses were presented to approximately 1,150 persons at six FWPCA field facilities.

Based on projections in "Manpower and Training Needs in Water Pollution Control," an estimated 24,000 new treatment plant operators and 32,000 new technicians will be needed by FY 1973.

At the same time, training programs for the 24,000 operators now on the job must also be expanded and improved. In response to this growing requirement, the FWPCA regional laboratory facilities are developing a greatly stepped-up program to support State efforts.

Training of sewage treatment plant operators has traditionally been viewed as a State responsibility. Now, however, FWPCA is offering practical courses in wastewater treatment plant operation, methods, and procedures both to operators and to State personnel engaged in operator training. This enables FWPCA to develop and test training techniques and materials which will ultimately be passed on to the States for large volume local operator training.

The number and variety of all training courses offered will be substantially increased. Approaches to course content and to presentation will be varied experimentally. As new laboratory facilities are built, training will be made available to more people in new locations.

To maintain training programs proportionate to the personnel needs, FWPCA facilities should be training not less than 5,000 persons per year by FY 1973. Such a rate contemplates scheduling 250 to 300 technical short-course offerings per year for FWPCA and State agency professionals, and subprofessionals, and for trainers of waste treatment plant operators.

Capitalizing on the far-flung Federal activities already involved in State training programs, FWPCA is launching an interagency training scheme. In this direct outgrowth of the Manpower and Training study, FWPCA is enlisting the cooperation of the Office of Education in the U. S. Department of Health, Education, and Welfare, and the U. S. Department of Labor. The goal is a national program for bulk training of new and incumbent personnel, particularly at the waste treatment plant level.

Already some aspects of FWPCA's training activities are providing inputs of new and tested course curricula, teaching techniques and illustrative materials. HEW and Labor have ongoing activities in their Vocational Education and

Manpower and Development programs, institutional connections within the States, well established field organizations, and substantial funding for mass training to meet labor shortages. Little, if any, of their present effort is directed to water pollution control. The skilled manpower need is recognized. FWPCA's several catalytic efforts are designed to stimulate the States to emulate these activities.

FWPCA's joining with two Federal agencies, long experienced in manpower training, should give tremendous impetus to the training of skilled manpower, a critical element in the waste treatment effort.

This Federal interagency leadership will encourage the States and local entities to expedite both upgrading of present personnel and training of new recruits at the local level. Nationwide, this activity can direct attention and effort to a crucial aspect of successful waste treatment--the mandatory certification of sewage treatment plant operators. States requiring such certification have been most successful in improving employment conditions for sewage plant operators. Providing technician status and career opportunity is an effective method of moving out of the situation too often extant, where untrained, ill-paid personnel operate plants at low efficiency.

The technical training grants program, inaugurated in FY 1968, is designed to increase the subprofessional manpower resource--engineering aides, scientific technicians, and waste treatment plant operators--required for water pollution control. Awards for funding of teaching staff, for purchasing equipment and for trainee stipends are made to technical schools, junior colleges, and similar educational institutions for full-time, specialized technical training in localities where training needs, both present and future, are most evident. Seven such technical training grants will probably be awarded in FY 1968. These will support pilot operations to demonstrate the value of various training techniques. The 1969 objective is to expand the technical training grants program to include 13 additional projects, supporting 200 full-time students. By 1973, the projected needs indicate that this activity should expand to 80 such awards capable of supporting 800 students.

The technical training grants projections are predicated on the assumption that the interagency effort described will successfully stimulate and generate the other Federal and State support necessary to meet the needs in this field. Grants are proposed only in sufficient amount to show the various types of training which should be offered and are designed for a modest increase over the five-year period to stimulate others.

Another aspect of stimulating State training is being studied--the possibility of Federal assistance in the construction of training facilities. Since this is still under exploration and would probably require new legislation, it is only noted here.

Professional training grants are awarded to academic institutions to establish or extend the scope of advanced training in water pollution control in their engineering, biological, physical, and social science departments. Under this program, institutions are encouraged to develop the specialized and multidisciplinary training of scientists, engineers, and administrators in water quality management. These grants support expansion and improvement of facilities and equipment. They also are being used increasingly as graduate trainee stipends to enlarge the number of individuals having knowledge in the fields of government, education, and industry as related to water pollution control. Awards are limited to five years, in order to put more new programs in operation.

In 1966, the awarding of 65 professional training grants at 51 institutions produced 92 graduates from a total of 364 trainees--64 with the M.S. degree and 28 with the Ph.D. degree. In 1967, the 71 professional training grants awarded to 58 institutions supported 415 professional students, with 217 graduating--174 with the M.S. degree and 43 with the Ph.D. An estimated 72 awards will be made in FY 1968 for the professional training of 465 students. 300 will graduate this year.

The Manpower Training Needs report indicated that the estimated 12,000 professionals now in the water pollution control field will have to increase more than threefold by FY 1974. As substantial and as innovative as it is, the professional

training grants program can only be considered as a catalyst in view of the overwhelming need for highly trained manpower. Merely to begin to meet the demand, the professional training grants must be extended through FY 1973 and probably beyond.

Research fellowships are awarded to individuals for specialized graduate and postgraduate research training involving investigations particularly related to FWPCA's mission. These awards support the intensive training of fellows in engineering and the physical and biological disciplines. They provide funds for institutional costs of education, stipends for the recipient, and allowances for supplies. A total of 158 research fellowships were active at 55 institutions in FY 1966. Of this number, two fellows received the M.S. degree and 48 were awarded the Ph.D. In FY 1967, out of a total of 148 active research fellows at 55 institutions, three received M.S. and 43 Ph.D. degrees. An estimated 93 fellows will receive this type of FWPCA support in FY 1968.

During FY 1968, the research fellowship program will reflect two major changes: (1) support will be limited to candidates for the doctoral degree, and FWPCA service fellowships will be established for mature, outstanding professionals whose talents can significantly contribute to FWPCA's mission, and who carry out their research at FWPCA laboratories for a stated period.

The costs presented below reflect only FWPCA's expenditures, thus only a part of the Federal effort in this important field. They are projected by subprograms for FYs 1969 through 1973. They include the cost of training a small number of FWPCA employees under the Government Employees Training Act, P.L. 85-507.

COSTS

(Thousands)

FY	Technical Training Operations	Technical Training Grants	Professional Training Grants	Research Fellowships	Graduate Training	Grants Administration	Total
1969	$ 901	$ 300	$ 3,235	$ 600	$ 254	$ 119	$ 5,409
1970	1,550	1,500	3,700	800	300	150	8,000
1971	1,800	1,900	3,800	1,000	300	200	9,000
1972	2,000	3,350	4,500	1,100	300	250	11,500
1973	2,000	4,500	5,200	1,200	300	300	13,500
TOTALS	$8,251	$11,550	$20,435	$4,700	$1,454	$1,019	$47,409

Technical Investigations and Assistance

Sections 5(a) and (b)

The growing complexity of pollution control problems demands a sustained and continued upgrading of our technical resources and knowledge to apply in solving the problems. The investigations, studies, and surveys which can recommend specific solutions are authorized in Sections 5(a) and (b).

Unlike research and development, whose principal objective is to develop and demonstrate new technology, the basic purpose of technical investigations and assistance is the application of existing knowledge to solve specific problems. Technical assistance primarily involves identifying the nature of the problem, recommending application of known methods and techniques to solve it or, if these are not available, recommending accelerated effort through research or other means for developing appropriate solutions.

Developing, maintaining, and effectively utilizing a force of technical experts is essential to water pollution control. These experts work closely with the other ongoing FWPCA activities, such as enforcement and comprehensive planning, to provide specific technical advice on complex problems. Of equal importance, they provide advice to the States, to other Federal agencies, to local governments, and others, drawing on FWPCA's nationwide technical resources.

Some recent examples of such assistance from FWPCA experts are:

(1) At request of the City of New York, evaluations were made of the water quality at the metropolitan area beaches; excessive coliform counts proved many of these waters unsafe for swimming.

(2) Pesticide analyses in various water bodies were made for the States of Florida, Alabama, and Georgia; for the Atomic Energy Commission's Savannah River plant

near Augusta, Georgia; and for the Governor's Commission on Lake Apopka, Florida.

(3) Pollution in San Diego Bay, California is being studied. An interceptor sewer system and treatment facilities for the metropolitan area, completed in 1963, effectively removed domestic sewage from the Bay. The study will determine the extent of the pollution caused by the discharge of untreated wastes from military, commercial, and recreational watercraft.

(4) A study was made to determine the causes of massive fish kills which occurred in the Lower Mississippi River in 1961-63. The pesticide endrin was identified as the cause; sources of this material were located, corrective action taken, and this potential danger to the raw water supply of New Orleans eliminated.

(5) The characteristics of sugar mill wastes and their effect on the waters of the Hawaiian Islands are being investigated at request of the Hawaii State Department of Health.

(6) A review was made for the U. S. Department of Health, Education, and Welfare to determine the adequacy of treatment proposed for wastes to be discharged from a proposed nuclear facility near Hartsville, South Carolina.

(7) At request of the Ohio River Valley Water Sanitation Commission, the problems associated with deep well disposal of industrial wastes are being studied. Small amounts of relatively untreatable wastes are being so handled. The study involves an evaluation of the sub-surface geology, engineering economics, and an estimate of the possible magnitude of use of this technique which may be of widespread importance.

(8) In addition to the many technical assistance projects completed or underway, there is an impressive list of requests which cannot be accommodated because of funding and personnel shortages. An illustration is the Louisiana request to identify the effects on the

aquatic environment of industrial wastes discharged by 17 plants on the Calcasieu River.

Requirements for this type of assistance are accelerating, particularly as water pollution problems are becoming more widely recognized. Accidental spills of pollutants, such as a recent fly ash release to the Clinch River in Virginia, are an ever present possibility. Means of solving or minimizing effects of accidental spills are under study. Similarly, there is a need to develop more effective means of carrying out the provisions of the Oil Pollution Act, 1924. Although oil spills are investigated in cooperation with the Coast Guard, the Corps of Engineers, and the involved States, and although technical advice and assistance are provided in combatting the resulting pollution, the dimensions of the problem require the development of better and expanded surveillance, a more effective alerting system and a substantially improved reaction capability.

To date, much of the resources necessary to provide this technical expertise have been located at the Robert A. Taft Sanitary Engineering Center and others of the FWPCA field laboratories. Requests for technical assistance, however, have far exceeded the resources available to provide such assistance. Furthermore, the demand for technical assistance is expected to increase as water pollution control accelerates, and as the States move toward implementation of water quality standards.

To meet these technical investigations and technical assistance needs, fuller staffing is planned to give each FWPCA region a strengthened capability for technical assistance response.

The estimated costs to meet the expanding need for assistance are:

	COSTS (Thousands)
FY 1969	$ 3,561
1970	5,000
1971	7,500
1972	9,500
1973	11,000
TOTAL	$36,561

Collection and Dissemination of Data

Section 5(c)

President Johnson, in his message on Quality of American Government, noted that "...decisions are only as good as the information on which they are based."

The implementation and enforcement of water quality standards, the development of comprehensive water pollution control basin programs, the administering of massive grant support, and the preparing of annual reports to Congress on pollution control costs, require up-to-date, accurate information if they are to be effective.

To provide knowledge on the extent and nature of water pollution calls for several types of information. First, we need to know what waste treatment and control facilities--municipal, industrial, Federal, or other--now exist. We need to know how effective these facilities are. We need to know present and future water uses. We need to know current and prospective pollution-caused problems. Overall, this is an estimate of the situation as it now stands.

Next, we must know how this situation changes and varies. How well are the facilities doing their job? Are water quality standards being met? Can breaches of standards be traced to sources? How can new situations be dealt with?

The objective of the FWPCA pollution surveillance program is to provide a mechanism whereby pollution control information and water quality data are collected, evaluated, and disseminated for use, particularly as they relate to the implementation of water quality standards, the establishment of water quality baselines, and planning and management programs. The collection of data is being done in full coordination with other Federal and State agencies in order that all available sources of technical information can be utilized at the national, regional and basin levels.

Continuous collection of reliable basin information on water quality, waste discharges, and treatment plants, is essential to the effective conduct of a dynamic national pollution control program. This has always been a requirement, but the needs will intensify with the establishment and implementation of water quality standards. Many of the difficulties being encountered in setting standards stem from a lack of, or gaps in, data. FWPCA will have to be able to detect violations of standards and measure progress toward objectives. The value of an orderly and adequate data collection and evaluation system to this effort cannot be overestimated.

Its data collecting effort over the years has given FWPCA a good start toward meeting these needs. Now the effort must be strengthened and intensified. We must increase our sources of data, ensure comparability from all sources through analytical quality control, and improve our STORET (STOrage and RETrieval) System computer programs in order to cope with new data requirements. During FY 1968, our efforts will be directed toward:

(1) Describing a benchmark indicating the status of municipal waste treatment facilities including specific, scheduled construction needs as identified by water quality standards, findings of enforcement conferences, and other reports.

(2) Planning for the implementation of a national industrial wastwater inventory and an updating of existing and necessary remedial measures at Federal installations.

(3) Operating of water quality monitoring stations at critical points, and assessing and initiating the coordinated Federal-State monitoring activities, both in terms of locations which must be monitored today, and the orderly growth of necessary monitoring to provide adequate national coverage by 1973.

(4) Strengthening the basic water analysis capabilities within each region to service FWPCA needs and to assist State regulatory agencies.

(5) Launching the Analytical Quality Control program, including the selection, adoption, and use of certified agency methods and techniques in the fields of physical and chemical (organic, inorganic, and radiochemical) methods, as well as biological analyses, to provide agencywide uniformity in techniques.

The outputs from this program all provide, on a continuing "current" basis, accurate measures of progress (facilities being constructed on schedule, trends in water quality), as well as identification of situations requiring remedial action (adverse water quality trends, noncompliance with either construction schedules or water quality goals).

This is by no means a solely Federal task nor is it confined to the FWPCA. We need to accelerate State monitoring activities, and we are working toward this through State program plans. We have improved coordination with the U. S. Geological Survey in utilizing that agency's basic hydrologic information. Over the long run, we will have to find ways of encouraging or requiring effluent monitoring as well as well as stream monitoring, and this will require new activities and attitudes on the part of cities, industries, and others.

Because the vast quantities of State and Federal data require continuous processing and evaluation, STORET is being upgraded. Initially, this computerized data processing system was developed to process water quality data from a variety of sources. Currently, the system is being expanded to process and evaluate additional types of data including facilities information, water quality standards, and implementation plans. Thus, we will be able to continuously compare facilities in-place versus construction schedules, and actual versus desired water quality conditions (i.e., progress by point, stream reach, basin and nationally). In addition, STORET capability will make possible the early identification of new types and sources of pollution and timely initiation of enforcement action.

While the increase indicated over the present level of expenditures may appear large, it is small as compared to the enormous investment in waste treatment and control facilities. It will

provide the best measure of what those treatment facilities are accomplishing.

To the extent that some of these needs are met by State agencies and others, FWPCA expenditures will be somewhat reduced. Significantly, this cost estimate includes no projection of effluent monitoring which should probably be assumed by the State-local governments and by industries.

The costs for the 5-year period are expected to be:

	COSTS (Thousands)
FY 1969	$ 2,330
1970	5,000
1971	8,000
1972	11,000
1973	14,000
TOTAL	$40,330

Research and Development

Sections 5(a) and (d)

While a great deal of progress in water pollution control can be made under existing technology, the need for new technology becomes strikingly evident when the amount and complexity of wastes produced by modern industrial establishments are carefully evaluated. Further difficult problems are posed by oil spills, agricultural runoff, acid mine drainage, and the extremely troublesome nutrients found in effluents of even the most efficiently operated waste treatment plants. When the volume, variety, and potency of wastes entering the Nation's streams are related to the ever-increasing demands for clean water, finding new ways to deal with pollution becomes a paramount issue.

To pursue the new technologies effectively, FWPCA's research and development effort is divided into eight programs substantively oriented to specific problems. Used in mutual support of these programs are in-house research at FWPCA laboratories and other

field installations, research grants to universities and others, demonstration grants to a wide range of collaborators, and contracts, all authorized in Section 5 and 6 of the Act. The eight program areas are as follows:

(1) Municipal pollution control requires the development and demonstration of technology for the effective and economical control of pollution from sewered and non-sewered wastes, combined (sanitary and storm) sewer discharges, storm sewer discharges, non-sewered runoff, and joint (municipal-industrial) wastes. Emphasis will continue on demonstrating improved techniques for the treatment of sewered wastes to augment the data necessary to completely prove a process. For non-sewered wastes, emphasis will be on demonstrating individual home, multiple home, and larger institutional treatment units.

Pilot and full-scale demonstration projects to test the applicability of control or treatment methods researched and developed in the areas of combined sewer and storm sewer discharges are well under way. These projects, funded under Section 6(a)(1) of the Act, focus on large-scale evaluation and demonstration of control technology. The Section 6 authorization will expire with FY 1969, though complete solutions are not expected by that time. Hence, an extension of this authorization or other funding will be necessary.

Special efforts are being made to demonstrate the technology necessary to permit joint processing of industrial and municipal wastes for greater economy and efficiency than independent handling of these wastes can achieve. Utilizing treatment, ultimate disposal and water quality control technology developed under other program elements, pilot and full-scale field evaluations and demonstrations will continue.

(2) Industrial pollution control technology must be developed and demonstrated to achieve effective and economical control of pollution from such industries as those

producing metal and metal products, chemicals and allied products, power, paper and allied products, petroleum and coal products, food and kindred products, machinery and transportation equipment, stone, clay and glass products, textiles, lumber and wood products, and rubber and plastic products. In FY 1967 studies were initiated to identify and analyze problem areas and to establish the existing state-of-the-art in treatment and control technology in selected industries.

The competitive economic aspects of industrial waste control require both conventional and completely new approaches to assure minimum cost solutions. Current waste treatment methods, while usually adequate for today's conditions, offer little promise of providing the type and degree of treatment which will be required over the long run. An effective attack on industrial pollution will require a cooperative industry-government effort to determine, develop,and install treatment processes, process modifications, water conservation programs, etc. By FY 1969, research and demonstrations funded by Section 6 grants will cover representative industrial pollution from all major sources. In terms of volume and biochemical oxygen demand, this will encompass over three-forths of the entire industrial waste load.

(3) Agricultural pollution requires research, development and demonstration of technology to control and prevent pollution from sources related to agricultural activity. Major forms of pollution associated therewith are nutrients, pesticides, and silt from runoff; concentrations of salts and other pollutants in irrigation return flows; runoff from animal feedlots; silt and other solids from logging and forestry operations; and unsewered domestic wastes. The composition of the agricultural wastewater is important in selecting the appropriate waste treatment process, in defining the degree of treatment required, and in determining the costs. Unfortunately, data on the quality characteristics of agricultural wastewaters are limited. The U. S. Department of Agriculture has provided helpful information, particularly to define research needs.

In-house research in this subprogram is carried out at the Corvallis, Oregon; Ada, Oklahoma; and Athens, Georgia laboratories along with associated field sites. The in-house effort will be significantly increased as staffing of these laboratories and the preliminary research are completed. Contract research tied to, and in support of, laboratory and field effort will be stepped up. Most of it will involve experimental pilot-scale applications of various methods to control runoff, irrigation return waters, and feedlot discharges. Grant funds will be used largely to support large pilot-scale and demonstration projects.

(4) Mining pollution control technology concerns the areas of mine drainage, oil production, uranium and other sources of mining pollution. As part of this sub-program, new technology must be developed and demonstrated to obtain effective and economical controls.

An estimated 4 million tons of acid mine drainage annually discharge into more that 4,000 miles of streams. Attempts to resolve or reduce such drainage have failed due to high costs or technical problems for which there were no immediate solutions. Several research and development projects are in the final stages of negotiation and others are being planned. The Senate-passed bill (S. 2760) if enacted, will give substantial new financial impetus to this program.

Problems related to oil production are of a different nature and solutions will be sought through laboratory and field work, including pilot and field scale demonstrations. The commercial production of petroleum from the oil shale deposits in the Rocky Mountains is a potentially serious source of pollution. Substantial research and development will be required to prevent saline and severe alkaline pollution in streams and aquifers, as well as siltation of streams, from becoming significant problems in the region. In other sources of mining pollution, FWPCA will seek to develop, evaluate, and demonstrate different levels of treatment

efficiency at field sites, under diverse operating conditions, and with various waste types.

(5) Other sources of pollution are significant and also require development and demonstration of technology for their effective and economical control. The sources are principally recreational boats and commercial vessels, construction projects, impoundments, saltwater intrusion, natural pollution, dredging and landfill, and oil.

Increasing amounts of wastes are discharged from the evergrowing number of recreational and commercial vessels which ply our waters, both inland and coastal. Most vessels are not equipped to give even minimal treatment to sewage and other wastes. Suitable on-board equipment for properly treating vessel wastes before discharge is not fully developed. Generally, on-board sewage treatment units are bulky and heavy, or only minimally effective. Further research, development, testing and evaluation are urgently needed to deal more effectively with these problems. Specific needs in this area are discussed in "Wastes From Watercraft," (Senate Document No. 48, 90th Congress, 1st Session). The companion Administration bills S. 2525 and H.R. 13923, if enacted, will provide a control program for pollution from boats and vessels.

Construction activities that affect the quality of water relate to real estate developments, roads, railroads, power transmission lines, mines and dams. The polluting substances likely to enter streams during and after construction include silt, chemicals, oil, gasoline, litter thrown from vechicles, and wastes from construction camps and trains.

Saltwater intrusion is a growing ground water pollution problem in coastal areas. This is of particular significance in California, Maryland, New Jersey, Texas and Long Island, New York. One solution now being researched involves recharging the aquifiers with renovated wastewater.

More detailed knowledge of surface reservoirs is needed if these are to be managed for optimum results in terms of water quality. Unfortunately, the storage of water in reservoirs can adversely affect its quality. Thermal stratification can occur, leading to chemical stratification and diminished dissolved oxygen concentrations in the colder bottom waters. By 1969, field evaluation projects should be in progress aimed at mechanical destratification of impoundments to alleviate these problems.

The complexity and extent of nonpoint sources of pollution require a concentrated in-house effort through a series of laboratory and field projects. These will be directed toward short-term problem solutions and evaluating and testing of long-term control techniques in these problem areas: dredging in the Great Lakes and Coastal areas, oil pollution in the East and Gulf Coasts, saltwater intrusion in all coastal areas, and pollution control techniques for impoundments.

(6) General pollution control includes all research, development, and demonstration, directed toward the prevention and control of accelerated eutrophication; the control of pollution by means other than waste treatment; the socio-economic, legal and institutional aspects of pollution; the assessment and control of pollution in extremely cold climates; the identification, source, and fate technology of a variety of pollutants; and the long-range solutions to pollution problems.

The aging of waters (eutrophication) has accelerated in recent years due to the nutrient loads imposed by increased quantities of municipal and industrial wastes, land runoff, and natural pollution. The basic mechanisms involved in lake eutrophication are not well understood. Controlling it calls for study of the biology and chemistry of the aquatic environment, more complete analytical data about nitrogen and phosphorus compounds, and research on new and improved methods for nutrient removal in waste treatment, including pilot plant studies and field evaluations. The enactment of S. 2760 would facilitate such research.

Development of water quality control technology is of major and increasing importance as the pollution control runoff by waste treatment becomes increasingly marginal. Such development includes the so-called at-source controls as well as such concepts as synthesis, diversion, dispersion, dilution, process change, and environmental treatment. Exploration of new techniques in these categories began in FY 1968; the promising ones must be moved into pilot-scale and field studies in FY 1969 as the exploratory work continues.

Mathematical models must be evolved relating pollution causes and the broad range of effects expressed in social and economic values. Research will be underway in FY 1969 to augment understanding of these factors. Research applicable to many sources of pollution must be expanded. This will include identification and characterization of pollutants, methodology for detecting and quantifying pollution sources, and determining the fate of pollutants as they move through the water environment--all essential to effective pollution control.

Staffing of the research laboratories at Ada, Oklahoma; Athens, Georgia; College, Alaska; Corvallis, Oregon, and associated field sites should be completed in FY 1969. Research at field sites will be increased. Contract research will directly complement the in-house effort, enlisting the specialized talents of researchers, from industry in particular. Contractors will explore new concepts in pollution control, utilizing their own facilities. Their findings will provide the seeds for full-scale evaluation and deomnstration of the new techniques in the early 1970's.

(7) Waste treatment and ultimate disposal technology covers research, development and demonstration for the renovation of wastewaters for reuse. Work in the laboratory has shown that it is technically possible to achieve any degree of waste treatment desired and, in fact, to return wastewater to a quality at least as high as it

was before use. However, considerable work remains to be done to achieve these degrees of treatment at any necessary location, under any conditions, and at minimum cost. Much of the overall FWPCA research effort is directed toward the development of completely new waste treatment processes. The objective is to develop, by 1975, feasible techniques for complete control of all point-source wastes. A panel of the Federal Council for Science and Technology has recommended a greatly accelerated advanced waste treatment program incorporating the best talents of the Federal Government, universities, private research groups, and industry. Such a program is underway and part of this continuing effort.

Because research findings have exceeded expectations, an accelerated program can be undertaken with increased assurance of both short and long-term payoffs in both pollution control and augmented water supplies through water reuse. Practical payoffs have already occurred with the design and construction of a number of full-scale demonstrations of several of the processes. Under the level of support proposed, it is reasonable to expect that suitable processes for purification of all waste streams and ultimate disposal of waste concentrates (both municipal and industrial) can be developed, field-evaluated, and demonstrated by the mid-1970's.

There is need for a continuing in-house effort, principally at the Cincinnati Laboratory, and increased use of contracts and grants to further develop or modify the known processes. At present, some 40 separation or ultimate disposal processes have been considered. Approximately 15 have been rejected, while the rest are at some stage of feasibility determination, pilot plant development, field evaluation or demonstration. Some 10 or 12 new approaches will be considered annually over the next few years and three or four of these are estimated to deserve investigation at least into the engineering development stage. Work will move into refinement and optimization of the treatment technology as the rough screening of process possibilities terminates. In line with this, the highly important field pilot plant studies will be emphasized.

Research grants will provide for a slight increase in university projects investigating some of the more fundamental aspects of process technology on the more important treatment processes. By FY 1969, processes will have moved further along the development sequence into pilot stage, field evaluation, and demonstration plants. Grants under Section 6(a)(2) will be used for advanced waste treatment projects.

(8) Water quality requirements research is needed to provide an improved scientific basis for determining the water quality necessary for municipal, industrial, agricultural, and recreational uses, and for the propogation of fish and other aquatic life; in other words research on the effects of pollution.

Far too little is known about the effects of pollution. The drastic effects (e.g., the massive fish kill) can be recognized, but quite often the true cause of such events cannot be defined even in extensive retrospect. To look ahead and to predict the occurrence of such events is, unfortunately, well beyond our current capability for any but the simplest stream systems under the least complicated set of environmental conditions and pollution loads. There is also the challenge of detecting, understanding, and then preventing the more subtle, long-term effects of pollution which could, even now, be robbing us of valuable water resources. Such effects, as yet unknown, may be just as real as the sudden fish kill, the unpalatable water supply, or the condemned bathing beach.

Because these problems are difficult to solve and the starting baseline inadequate, a rapidly accelerated program is needed. Staffing of the recently completed National Water Quality Laboratory at Duluth, Minnesota, as well as increased staff at the National Marine Water Quality Laboratory, Narragansett, Rhode Island, and at several field sites including the Fish Toxicology Laboratory at Newtown, Ohio, will contribute to this effort. This in-house effort must be supplemented with contracts, and grants to obtain the services of highly specialized and often uniquely qualified investigators.

The costs of carrying on the research and development authorized by Section 5 include grants to universities and others, contracts, and in-house research. In addition, some research and demonstration, described herein, is supported by funds authorized under Section 6.

	COSTS (Thousands)
FY 1969	$ 28,002
1970	45,000
1971	50,000
1972	50,000
1973	50,000
TOTAL	$223,002

Field Laboratory and Research Facilities

Section 5(e)

Strong focal points of research, technical assistance, and analytical capability are required to attack and cope with regional and national pollution problems. Field laboratories and research facilities provide such focal points and are also excellent locations for training of workers in the best known methods and techniques in water pollution detection and control.

Under the authority of Section 5(e), the FWPCA has established one national and four regional laboratories. These laboratories are developing strong research and development capabilities, pollution control expertise, analytical services, and training programs.

The regional laboratories, located at Ada, Oklahoma; Athens, Georgia; College Alaska; and Corvallis, Oregon, are oriented primarily to the predominant pollution problems in their respective regions. At the same time, many of these regional findings

will be applicable to similar situations throughout the country. For example, research and development directed toward the solution of problems associated with the pulp and paper industry is concentrated at the Corvallis Laboratory. The results here are obviously transferable to other regions. Similarly, solutions to problems associated with the pollution of groundwater are being developed at the Ada Laboratory and will have widespread application.

The National Water Quality Laboratory, located at Duluth, Minnesota, is concerned largely with researching water quality requirements for fresh water uses. The results of this research will ultimately provide a basis for refining and improving water quality standards everywhere.

The Cincinnati Water Research Laboratory, located at the Robert A. Taft Sanitary Engineering Center in Cincinnati, Ohio, was established prior to the Section 5(e) authority. It is involved in a wide variety of activities oriented toward both national and regional problems.

Because of the urgent need to get work underway on water quality requirements for all marine water uses, temporary facilities have been occupied at Narragansett, Rhode Island. This is the forerunner of the National Marine Water Quality Laboratory proposed for this location.

Seven additional laboratories have been planned or authorized to provide on-the-scene support for regional water pollution problems and programs in other regions of the Nation. Planning and construction funds are available now for two of these laboratories, and planning funds are available for an additional four laboratories. No new obligational authority will be requested for FY 1969. The operation and routine maintenance costs of these laboratories have been included in the program costs identified with other sections of the Act. The planning, construction, equipment, repair and improvement costs of the FWPCA laboratories are shown in the following table.

NEW OBLIGATION AUTHORITY

(Thousands)

	Planning	Construction	Equipment	Repair and Improvement	Total
FY 1969	-	-	-	-	-
FY 1970	250	5,500	1,200	1,350	8,300
FY 1971	-	7,000	1,300	700	9,000
FY 1972	-	-	1,000	1,000	2,000
FY 1973	-	-	300	1,100	1,400
TOTAL	$250	$12,500	$3,800	$4,150	$20,700

Great Lakes Water Quality

Section 5(f)

Section 5(f) recognizes the special importance of the Great Lakes in the nation. This subsection directs the FWPCA to conduct research, studies, and technical development work with respect to the present and future water quality of the Great Lakes.

FWPCA has placed great emphasis on developing an understanding of the Great Lakes and their special problems. For example, various long-range studies of the Great Lakes have been underway as a part of the comprehensive programming delineated in Section 3. Another example is the joint FWPCA and Corps of Engineers effort to evaluate the effects of dredging operations on Great Lakes water quality. Once this is determined, these agencies will jointly arrive at operating procedures to control and abate any degradation of water quality due to dredging. Technical studies have been made in support of Federal enforcement actions involving Lake Erie and Lake Michigan.

In addition, many FWPCA projects are developing technology of nationwide applicability which will be useful in the Great Lakes area. Also, the planned Great Lakes Regional Laboratory at Ann Arbor, Michigan, will be the center of research on water pollution problems of the Great Lakes.

Costs related to this subsection are dispersed throughout the FWPCA's programs, such as comprehensive planning, technical assistance, pollution surveillance, water quality standards, and research and development. Therefore, they are not separately identified here.

Estuarine Pollution

Section 5(g)

The 900-1,000 discrete estuarine systems in the United States have been an unrecognized national resource, one of the few remaining natural resources whose use is not guided, in some degree, by national policies or programs. Sixty percent of the United States population lives in the States bordering the oceans. Coastward migration continues. The oceans have a direct impact on the health and welfare of every coastal resident, as well as on the tens of millions of Americans who swim, boat, fish, and relax along our coasts. Also, thousands of commercial fishermen depend on our bays, estuaries, and nearshore coastal waters for their catches.

A great many programs as carried on by the States and at least ten Federal Departments or independent agencies, have a significant effect upon the estuaries, or are affected by estuary use or management. Few of these programs are oriented toward the preservation and development of the estuarine resources. Many conflicting pressures exist for uses of the estuaries, and many of these destroy an estuary for other uses.

Local communities and States have a major stake in the use and development of these resources. Many areas are already taking action to preserve, protect, and develop their estuarine resources, but most such actions are on a piecemeal basis. However, no central Federal encouragement for this effort or central guidance toward a nationally accepted objective exists.

There is a growing awareness of the resource values of the Continental Shelf and other near-shore areas. The development of these resources will be stimulated by the entering into force of the Convention on the Continental Shelf in 1964 and by the Marine Science and Engineering Development Act of 1966. The Convention has the technical effect of increasing the land area of the United States by more than one million square miles, or over 25 percent. The Marine Science and Engineering Development Act established a positive oceanographic policy for the United

States and calls upon the Federal establishment to develop a program which will accelerate the development and utilization of marine resources.

These efforts will profoundly affect FWPCA. The agency must consider problems of waste disposal into ocean areas; pollution problems associated with resource development off the Continental Shelf; and the disposal of sludge, dredging, industrial wastes, or domestic sewage into shore areas. Solution of the technical problems in these areas will require formulation and continued review of new policies and procedures.

FWPCA has taken the lead as authorized and directed in Section (5)(g) to conduct, in cooperation with other appropriate Federal, State, interstate, and local public bodies and private organizations, institutions, and individuals, a comprehensive study of the effects of pollution upon the aquatic environment of the Nation's estuaries. A report of this study is to be made to the Congress by November 1969. It will analyze the importance of estuaries to the economic and social well-being of the people of the United States and the effects of pollution upon estuaries; it will discuss major social and economic trends in the estuarine zones; and the report will recommend a comprehensive national program for the preservation, study, use, and development of estuaries.

Information is being obtained through other agency contacts, contract studies, and the findings of other FWPCA activities concerned with the marine environment. In addition, approximately 28 public hearings are planned at strategic locations around the country beginning in January 1968. These hearings will enable local government officials, industry, conservation groups, and private citizens to present their views on the use and value of estuaries directly to the study team.

A program arising from the study's recommendations would involve substantial costs which are not included here. It is estimated that the present study will require the $1,000,000 authorized for FY 1969 by the Congress, and an additional $1,000,000 authorization which will be sought for the completion of the study in FY 1970.

GRANTS FOR RESEARCH AND DEVELOPMENT

(SECTION 6, FEDERAL WATER POLLUTION CONTROL ACT)

A unique and massive approach to three of pollution control's most widespread and important problems is stimulated through the grants authorized by Section 6. The uniqueness lies in the Federal support given for actual operational demonstrations by users of new approaches to common waste treatment problems. The problems to be attacked are particularly troublesome. Not only are they widespread, but solutions are complex and will probably be expensive. Furthermore, communities and industries tend to avoid investment in untried treatment methods.

The three areas involved are: (1) controlling polluted discharges from storm or combined sewers, (2) developing advanced waste treatment processes and water purification methods and new joint treatment for municipal and industrial wastes, and (3) methods for controlling pollution by industrial waste treatment. As innovations, the demonstrations described offer practical operational-scale examples designed to show effectiveness and applicability to other users. As experimental ventures, they will receive Federal support as grants of up to 75 percent of the project cost, and 100 percent as contracts. The Federal support will stimulate realistic experiments which will demonstrate new and improved techniques which otherwise would not be reduced to practice because of the risk of failure and the substantial capital investment required.

Under Section 6, projects may be supported by grant or contract at full-scale under actual field conditions, aimed at achieving widespread adoption. These activities are an integral part of the entire research and development program supported under Section 5. Comment on the substance of the program is found in that section.

Interest in these demonstrations is evinced by the nature and extent of participation in these cost-sharing projects. Response to this program in the past one and one half years has been very good. Section 6 funds are supporting such diverse projects as

Chicago's evaluation of the effectiveness of a deep underground tunnel system to store temporarily excess combined-sewer flows for return to the sewage treatment plant during off-peak hours. This project will demonstrate the efficacy of reducing the discharge of untreated combined sewage to the receiving stream and minimizing overloading of the waste treatment plant. Should the method prove economically feasible, the Chicago Metropolitan planners envision a vast deep tunnel network for ultimate control of all water in excess of that which can be handled by its waste treatment facilities.

FWPCA has awarded a grant to Cleveland to demonstrate that an overloaded sewage treatment plant can improve its effluent quality by employing polyelectrolytes. The polyelectrolyte is an additive which destroys the electrical charge surrounding a particle, permitting the particle to settle out. Based upon pilot plant runs, this demonstration is expected to show that a very small addition of polyelectrolytes will increase the suspended solids removal by almost 50 percent, eliminating any need for further treatment or plant expansion.

The Pulp Manufacturers Research League is the recipient of a Research and Development grant to demonstrate full-scale in-plant concentration and treatment of dilute wastes from the pulping industry. This project will utilize a mobile reverse osmosis unit capable of treating 50,000 gallons of waste per day. Field evaluation will be carried out at each of six different paper companies, using different waste streams. The results from this demonstration project should add appreciable information to water pollution control technology of the pulp and paper industry. These are but a few of the studies which Section 6 grants are now supporting. FWPCA is constantly searching for other new ideas and project proposals.

These demonstrations of improved technology are designed to determine the effectiveness, reliability, and costs of pollution control processes. Administrators will be able to proceed with confidence when ordering abatement programs which require new techniques. The broad application by municipalities, industries and others of those methods which prove successful will have an impact and public benefits far exceeding the costs of carrying out Section 6.

Existing authorizations expire after FY 1969, the first year under consideration in this report. The Department will introduce legislation to extend them in the 2nd Session of the 90th Congress. The importance of these programs, the widespread participation and support evidenced, and the wide range of technical solutions requiring demonstration, all point to the need to extend these authorizations. The figures shown below are estimates of the optimum levels at which each of these program components could be carried out, based upon current indications of the range of technologies requiring testing and upon response of potential participants. It is recognized, of course, that authorization levels and actual appropriations may depart sharply from these estimates, depending upon timing and amount of emphasis to be given to this program.

COSTS
(Thousands)

FY	Storm Sewers	Advanced Waste Treatment	Industrial Treatment	Total
1969	$ 8,000	$10,000	$10,000	$ 28,000
1970				60,000
1971				60,000
1972				60,000
1973				60,000
TOTAL				$268,000

GRANTS FOR WATER POLLUTION CONTROL PROGRAMS

(SECTION 7, FEDERAL WATER POLLUTION CONTROL ACT)

State agencies are the first line of defense in the national water pollution control effort. During the period 1969-73 their responsibilities will increase as that effort gains momentum. Increased State capability will be needed to regulate waste discharges, to supervise construction and operation of waste treatment plants, to train plant operators, to monitor water quality, and to implement the newly established water quality standards.

Section 7 authorizes grants to State and interstate agencies to assist in meeting the costs of establishing and maintaining adequate measures for preventing and controlling water pollution, including the training of personnel.

In 1963 a study by the Senate Committee on Public Works, "A Study of Pollution-Water." (Staff Report to the Senate Committee on Public Works, 88th Congress, 1st Session, Committee Print), indicated that few States had adequate water pollution control programs. The need for State program improvement was further highlighted in a study, "Staffing and Budgetary Guidelines for State Water Pollution Control Agencies," done by the Public Administration Service for the Public Health Service in 1964. Despite recent strengthening and improvement by a number of States, most State programs are still considered inadequate, although program effectiveness is difficult to quantify. Based on FWPCA's review of State program plans for FY 1968 which considered such factors as State agency authority, budget, staff, and treatment plant operator certification; establishment of intrastate water quality standards; water quality planning activity; and water quality monitoring; only about one-third of the States are now considered adequate. The kind and degree of improvement needed varies widely from State to State. During the next five years, every effort will be made to upgrade State programs.

Program grants are also awarded to interstate pollution control agencies. These interstate agencies, such as the Delaware River Basin Commission and the Ohio River Valley Water Sanitation Commission, likely will assume a more important role with a growing emphasis upon basinwide cleanup. In addition, basin planning grants under Section 3(c) of the Act may lead to the establishment of new permanent interstate agencies which will become eligible for continued program support under the program grants provision.

This program started with a $3,000,000 annual authorization beginning in FY 1957 which was increased to $5,000,000 per year in FY 1962. By the end of FY 1967, $40,660,000 had been distributed to State and interstate agencies as shown in the following table. This money has helped these agencies hire qualified people, develop laboratories and other facilities, and generally increase their pollution control efforts.

The Clean Water Restoration Act of 1966 increased the annual authorization to $10,000,000 for FYs 1968 through 1971. To assure the most effective utilization of these increased funds, the FWPCA issued "Guidelines for Developing Fiscal Year 1968 Program Plans for State and Interstate Agencies." These Guidelines set forth the essential elements of an effective program plan as a basis for receiving the Federal grant. Each agency applicant must now describe how it will carry out a broader improved water pollution control program with the increased Federal grant.

The grant authorization expires in FY 1971. The present projected cost of carrying out this section of the Act assumes that the authorization will be extended beyond FY 1971 at its current level. However, it may prove desirable to increase this authorization in 1972 and 1973. By that time, a number of pollution control efforts now underway will be reaching a peak of activity. If major Federal construction grant (Section 8 of this report) support is available, the State agencies will need to increase their staffs to supervise the expanding construction program.

	Total FWPCA Grants for Water Pollution Control Programs	State WPC Agency Expenditures	Interstate WPC Agency Expenditures	Total Expenditures
1957	1,800,000	4,004,501	181,132	5,985,633
1958	2,700,000	N/A*	N/A*	N/A*
1959	2,700,000	6,514,980	370,628	9,585,608
1960	2,700,000	6,755,822	345,232	9,801,054
1961	2,700,000	7,606,088	717,801	11,023,889
1962	4,500,000	8,162,954	835,840	13,298,794
1963	5,000,000	9,277,135	636,021	14,913,156
1964	5,000,000	9,530,490	615,542	15,146,036
1965	5,000,000	11,204,986	681,778	16,886,764
1966	5,000,000	12,271,400	702,103	17,973,503
1967	5,000,000	17,642,924	506,333	23,149,257

*Not available

There will also be an increased need to monitor water quality and assure compliance with water quality standards now being established. These combined factors will place a heavy burden on State and interstate agencies. Evaluation of State program effectiveness and needs and evolving State-Federal relationships in the national pollution control effort during the next several years should provide a basis for determining whether and to what extent Federal program grants should be increased.

Costs of administering this portion of the Act consist largely of providing personnel to work with the State agencies in developing more effective programs. Certain grant processing costs are also involved. These administrative costs are included under Section 3(a). Funds required for the grants per se are projected as:

	COSTS (Thousands)
FY 1969	$10,000
1970	10,000
1971	10,000
1972	10,000
1973	10,000
TOTAL	$50,000

GRANTS FOR CONSTRUCTION

(SECTION 8, FEDERAL WATER POLLUTION CONTROL ACT)

Considerable progress was made in 1967 toward defining national water pollution control goals and waste treatment requirements, through the development of water quality standards and improved State program plans. Attainment of these goals will require continuing large capital expenditures for waste treatment facilities. Section 8 of the Federal Act authorizes grants to

State, interstate, municipal and intermunicipal agencies for constructing the necessary facilities to prevent the discharge of untreated or inadequately treated sewage or other wastes into any waters.

In 1956 Congress recognized the need for a cooperative Federal-State-local effort under the stimulus of Federal leadership and funds. Since that time, the Federal Government has provided almost a billion dollars as construction grants for sewage treatment plants. The resulting facilities now serve some 62 million people and enhance water quality in 66,000 miles of rivers and streams.

The Congressional amendments of 1965 and 1966 provided for a vastly accelerated Federal effort and State and local governments responded accordingly. The previous section discussed expansions in the State water pollution control programs. One of the major purposes was to improve the States' capacity to encourage waste treatment construction where the needs are most acute. More and more of the States are establishing grant programs of their own to further stimulate local construction of waste treatment facilities and to take advantage of the larger Federal grants authorized, thus sharing the costs. Local planning groups are increasingly participating in reviewing proposed sewage treatment construction to ensure conformity with local and regional needs. Finally, the backlog of grant applications is an encouraging sign that more and more cities are now facing up to their responsibilities in controlling municipal pollution.

A good part of this heightened State and local effort has been premised on the expectation that Federal funding would go much higher than recent fiscal constraints allow. But as yet, the State and local commitment has not flagged. In fact, present construction levels have outpaced the proportionately available Federal grant funds.

To project the amount of Federal participation required in this important phase of water pollution control, the total needs must be defined. To control municipal waste discharges and to attain the water quality levels specified by the water quality standards implementation plans, waste treatment facilities must be

built where none exist, improved where they are obsolete, and enlarged as populations grow. A companion report to this one, "The Cost of Clean Water " estimates that an $8 billion capital investment (constant dollars) over the next five years will be necessary to accomplish these goals.

Under the information currently available Federal participation at near the maximum amounts set by Congress in the 1966 legislation would be necessary to stimulate capital investment of this magnitude. Under the Act the Federal contribution can go as high as 55 percent of the eligible project cost, under certain conditions. A 35-40 percent average over the next five years would be a reasonable estimate. Therefore, to overcome the estimated backlog and meet water quality standards by 1973 would require Federal grants in the range of $2.8-$3.2 billion.

This figure includes only new projects to be started in Fiscal Years 1969 through 1973. Many projects initiated since July 1, 1966 have received only partial or no Federal funding because there was not enough money to go around. Under the Act, these projects are eligible for their full share through FY 1971.

The total estimated requirement for Federal construction grants, FY 1969-1973, to overcome the backlog of unmet needs and keep pace with growth during this period, would be approximately $2.8 to $3.2 billion. The Clean Water Restoration Act of 1966 authorized $450 million for 1968, $700 million for 1969, $1.0 billion for 1970, and $1.25 billion for 1971. In 1968, $203 million was appropriated and the President's budget for 1969 requests $225 million.

In view of the need to greatly accelerate the construction program to meet the needs outlined above, the President will propose a new method for financing the program. The proposed legislation would authorize the Secretary of the Interior to enter into long-term contracts with States and municipalities for the Federal Government to make annual principal and interest payments on the Federal share of bonds raised by localities to meet total project costs. Bonds raised by localities would not be tax exempt, but the legislation will provide for an interest subsidy adequate to bring costs to localities down to the same level as tax exempt borrowing.

Eligibility under this program would be based on the requirement that the project serve either all of a standard metropolitan statistical area, or an area of 125,000 people or more. The proposal would also require a local public body having jurisdiction over the project to establish a system of charges designed to amortize the cost of the project, including that covered by the Federal share and, when applicable, the State share, and the cost of operating and maintaining the project over its life. This system would enable the local public to provide a reserve to meet, to the greatest extent possible, future expansion or replacement requirements of the project. The proposal would permit the Secretary to waive the charge requirement under certain limited conditions.

The proposal would require the State to initiate an effective operator certification program approved by the Secretary by July 1, 1969. It would also require the State to develop, by the same date, an approvable statewide plan to improve the efficiency of treatment works constructed prior to July 1, 1968, and operating since that date. These last two features would be conditions for assistance for the grant and contract program.

The proposal would amend the reimbursement provision in the Act added in 1966. Since the purpose of this provision was to give retroactive assistance if Federal funds were not available, it becomes less necessary if the contract authority program is authorized. Therefore, this authority would be terminated as of July 1, 1968, although projects already under construction prior to that date would still be eligible for reimbursement from State allotments.

If amounts authorized can be made available through the regular grant program and the contract program, the objective would be close to attainment. The actual level will be geared to the ability of communities to respond to a greatly accelerated program, and prevailing monetary and fiscal policies.

The estimates of need outlined in "The Cost of Clean Water" are conservative and are presented in constant dollars. Consequently, any increase in construction costs will increase the needed Federal support. Also any number of other circumstances could further alter requirements and the amount which must be expended. For example, the development of inter-

municipal systems and districts could substantially reduce overall costs, as well as contribute to more effective pollution control.

Further, this tremendous investment, large as it is, would not lead to a respite at the conclusion of the fiscal 1969-73 period. Population growth and plant obsolescence are continuing factors. Operation and maintenance costs will continue to rise as more plants are put in place, and as efforts to improve operating effectiveness bear fruit. Catching up with basic municipal waste treatment needs will only ease the pace a bit and prepare the Nation to move ahead to the next problems, such as facilities to handle stormwater overflows and the higher levels of waste treatment which will increasingly be required. This will be necessary if the quality of water is to be protected in the face of continued population and industrial growth. Any accelerated construction program should be accompanied by serious efforts to improve financing arrangements at the municipal level, to prepare municipalities to meet these future costs.

Of ever increasing concern is the need to improve this return on investment in terms of clean water through more effective operation and maintenance. Performance audits have been made on grant projects. Although these have given only limited information on maintenance and operation levels, they have been sufficiently detailed to highlight the need for improvement in these vital areas. This is an emerging problem which will require substantial efforts in order to define more fully the required operating levels and actual plant capabilities, and to undertake or stimulate the necessary training, the expert technical assistance, and the more effective supervision and certification of operators required to achieve optimum results.

The proposed legislation provides for encouragement of intermunicipal systems, improved local financing, and better operation and maintenance.

Pending Congressional consideration of this far-reaching legislation, only the costs of administering the program requested in the President's Budget for 1969 and authorized by the Act for 1970 and 1971 are presented, as follows:

COSTS
(Thousands)

	Grants	Administration
FY 1969	$ 224,000	$ 2,667
1970	1,000,000	4,400
1971	1,250,000	5,300
1972		
1973		
TOTAL	$2,475,000	$12,367

WATER POLLUTION CONTROL ADVISORY BOARD

(SECTION 9, FEDERAL WATER POLLUTION CONTROL ACT)

Section 9 establishes a Water Pollution Control Advisory Board consisting of the Secretary of the Interior, of his designee, as chairman, the Secretary of Health, Education, and Welfare, and nine representative public members appointed by the President.

The Board advises and consults with the Secretary of the Interior and makes recommendations to him on matters of policy arising under the Act. In general, the Board's goals are to provide the Secretary with useful supplementary information and points of view on water pollution control and to both shape and reflect public understanding of the problem.

Over the years, the Board has provided valuable advice to the Secretary on many important issues. It has also stimulated public awareness of the pollution problem and of the means for its control and has championed vigorous national, State, and local control programs.

Over the next five years the Board will continue to respond to the needs of the Secretary of the Interior. It is impossible, however, to detail a sequence of its activities covering the period. Recently the Board has been asked to direct attention

to the problem of thermal pollution and to the question of the most effective form of river basin organization for water pollution control. Increasingly the Board will hold its meetings outside of Washington, D. C., at the Secretary's suggestion, and this should heighten its effectiveness.

The costs generated by this section of the Act are for a small secretariat at headquarters and for per diem and travel expenses of the Board when in session.

Costs for the Water Pollution Control Advisory Board for FY 1969-1973 are projected at approximately $90,000 per year. They are included in the total under Section 12.

ENFORCEMENT MEASURES AGAINST POLLUTION OF INTERSTATE OR NAVIGABLE WATERS

(SECTION 10, FEDERAL WATER POLLUTION CONTROL ACT)

All the programs of the FWPCA must be backed up by effective regulation, through enforcement if necessary. While the States retain primary responsibility for enforcing pollution control measures, the Federal Government has a vital role, deriving from Section 10 of the Federal Water Pollution Control Act.

This section provides for two closely related lines of action: establishing and enforcing water quality standards for interstate, including coastal, waters in conjunction with the States; and through enforcement actions, securing the abatement of pollution in interstate or navigable waters, which endanger public health or welfare.

Enforcement

Section 10(d)-(k)

The Federal enforcement program, since 1957, has contributed greatly to abating water pollution. From that time, 43 actions affecting more than 40 States and the District of Columbia have been instituted. Many conferences have been reconvened on occasion. The scope and impact of the enforcement conferences are suggested by those relating to Lake Erie, held in 1966 and 1967. Representatives of Michigan, Indiana, Ohio, Pennsylvania, and New York agreed to a far-reaching schedule for abating pollution in Lake Erie. Some 54 municipalities and 80 industrial establishments are affected.

In addition to reaching agreement on measures for coping with municipal and industrial discharges, the State enforcement authorities have received FWPCA support for their own efforts. Research and construction needs have been identified, and the iterim enforcement study projects themselves have developed valuable new information of general applicability. Perhaps most important of all, over the years the enforcement conferences in various places have alerted the public to water pollution problems contributing immeasurably to stronger national, State and local control programs.

During FYs 1969-73, the enforcement actions currently underway will continue as necessary to achieve the ends for which they were initiated. Other actions will be initiated as required. Legal actions under the Oil Pollution Act, 1924, will also be forthcoming when appropriate.

The enforcement activity over the next five years will be affected significantly by the new water quality standards which vastly strengthen, expand, and even revolutionize the enforcement capability. There is no way at this time to predict the extent to which the enforcement authority must henceforth be applied. Much will depend on how effectively the States exercise their responsibility for meeting the water quality standards.

Nevertheless, FWPCA will need certain levels of resources to develop information on violations, prepare cases, and pursue them. These projections are based upon the current level of activity and on the initial standards experience.

	COSTS (Thousands)
FY 1969	$3,498
1970	5,000
1971	5,000
1972	5,000
1973	5,000
TOTAL	$23,498

Water Quality Standards

Section 10(c)

By the beginning of FY 1969, the initial water quality standards setting process should be essentially completed. This will result from over two years' sustained effort on the part of the States and FWPCA in which a new tool in the national water pollution control program was developed from a limited base. Defining goals, developing guidelines, and reviewing, negotiating and approving the State submissions--all were involved and difficult tasks.

As of January 1, 1968, the standards of ten States had been approved by the Secretary of the Interior. Negotiations have gone well, in all but a few States, toward meeting the objective of having standards in approvable form by the beginning of 1968. In those cases where approvable standards are not developed in the near future, the Federal Government may have to establish standards.

When standards are set, the Nation will have, for the first time, a body of specific goals and objectives for its waters and, in the implementation plans, realistic means for accomplishing those goals and objectives. Clearly this will be a landmark in water resource conservation.

At this point, the second phase will begin, characterized by the refinement and attainment of the goals. FWPCA will begin to seek and observe compliance with the standards. Although States have first responsibility, FWPCA will continuously review the extent to which implementation plans are being carried out. Extensive water quality monitoring by FWPCA as well as State and other Federal agencies will be important in the review process. Knowledge gaps discovered in the initial phase indicate a need for special studies to deal with various technical problems. Marine waste disposal, salinity, and temperature are three examples. Also needed is research to improve our judgements concerning water quality requirements. Finally, the water quality standards will have to be revised and upgraded at such time in the future as technical knowledge improves and as waste disposal conditions and water use change.

Attainment of the water quality set in the standards will constitute FWPCA's principal program objective in the future. Accordingly, they will have a heavy impact on how all program resources are used. Construction, program and planning grants, technical assistance, research and development, training, monitoring, planning, and enforcement activities, among others--all will be directed with the water quality standards goals foremost in mind. Thus, a good deal of the moneys reported herein under other sectionsof the Act will be used in carrying out the general responsibilities defined in Section 10. The costs projected below, therefore, are the relatively modest and stable sums needed for checking implementation progress, evaluating the standards, and coordinating various FWPCA activities in the interest of achieving the water quality standards goals.

	COSTS (Thousands)
FY 1969	$ 729
1970	1,000
1971	1,000
1972	1,000
1973	1,000
TOTAL	$4,729

COOPERATION TO CONTROL POLLUTION FROM FEDERAL INSTALLATIONS

(SECTION 11, FEDERAL WATER POLLUTION CONTROL ACT)

The Federal Government must set an example of leadership nationally by preventing, controlling, and abating pollution from its own activities.

Section 11 directs all Federal agencies to cooperate with the Secretary of the Interior, and with State and interstate agencies and municipalities in preventing and controlling water pollution caused by Federal activities. Executive Order No. 11288 supplements Section 11 by establishing general standards and procedures to facilitate Federal agency budgeting for water pollution control measures.

FWPCA's responsibilities under Section 11 and the Executive Order include: assisting Federal agencies to clean up pollution from their facilities; reviewing proposed Federal water resources projects to determine their impact on water quality; helping other Federal agencies to include water pollution control standards in their loan, grant, and contract practices; and assisting other agencies to prevent pollution from Federal vessels.

FWPCA's program under this section began early in 1966. To facilitate interagency cooperation and provide a framework for coordination between Federal and non-Federal agencies, FWPCA has issued "Guidelines for the Prevention, Control and Abatement of Water Pollution from Federal Activities." Through its programs of review and technical assistance, FWPCA has helped develop water pollution control programs at Government military bases, hospitals, national parks and forests, post offices, and Federal water resource development projects.

Agreements on program procedures have been reached with the Forest Service, the Bureau of Public Roads, and the Corps of Engineers. Similar understandings are being worked out with the National Park Service, the Bureau of Indian Affairs, the

Bureau of Outdoor Recreation, and the Department of Defense. These agreements assure that pollution control measures for facility construction or maintenance will become an integral part of agency planning.

FWPCA reviewed plans from 16 agencies for improving water pollution control at Federal installations. As a result of priorities recommended to the Bureau of the Budget, the FY 1968 Federal budget included requests for $51 million to upgrade water pollution control at Federal installations.

All this activity is just the beginning of the continuing effort which must be strengthened, to indicate that the Federal establishment intends to put its own house in order. The almost unlimited activities pursued under Federal loans, grants, and contracts offer a particularly significant means of exercising Federal leadership. Section 7 of Executive Order 11288 encourages all Federal agencies to include water pollution control standards in their loans, grants and contracts.

FWPCA has reviewed reports from 21 other Federal agencies detailing to what extent their loan, grant, and contract procedures should include such standards. It is clear that there still are major unutilized opportunities for using the procedure- for example, to prevent thermal pollution from nuclear electric power generating plants.

A Department Task Force has comprehensively reviewed the loan, grant, and contract practices of Interior and other agencies, and will propose pollution control requirements that might apply to borrowers, grantees, and contractors. In addition, the Department has informed all its Bureaus that Interior is expected to set an example in this government-wide effort. The Bureaus have been directed to submit for FWPCA review all proposed regulations for water pollution control. This applies to leases, licenses, and permits issued by the Department as well as loans, grants, and contracts.

FWPCA proposes to pursue this program vigorously since it is essential that the Federal Government set a good example in water pollution control. Current plans call for control of

pollution from all existing Federal installations within five years. Additional staff is necessary to carry out this program during FYs 1969-73. Experience to date indicates a need for more aggressive implementation of Section 7 of Executive Order 11288. This, too, will increase FWPCA's workload.

The cost estimates set out below assume that FWPCA's activities under Section 11 and Executive Order 11288 will be broadened as indicated above. The costs are related almost entirely to providing personnel to work with other agencies in reviewing their plans and regulations and providing technical assistance in developing pollution control measures. These costs should level off once the backlog of existing pollution control needs is eliminated and the Federal agencies get their control programs established.

	COSTS (Thousands)
FY 1969	$ 758
1970	1,200
1971	1,400
1972	1,400
1973	1,400
TOTAL	$6,158

ADMINISTRATION

(SECTION 12, FEDERAL WATER POLLUTION CONTROL ACT)

No matter how much money an organization has for its specific program activities, general administrative strength which enables funds to be spend wisely is a vital prerequisite to achieving goals. Under Section 12 of the Act, which authorizes the Secretary of the Interior to prescribe regulations, to engage staff and to utilize funds to carry out the purposes of the Act, this administrative strength is being built by FWPCA.

In its 20 months in the Department of the Interior, FWPCA has established or is in the process of establishing manpower, facility and equipment resources, and managerial arrangements to facilitate accomplishing its objectives. A strong basic cadre came from FWPCA's predecessor agency in the Public Health Service. Many of the experienced personnel were members of the PHS commissioned Corps and understandably chose to retain this status. However, several hundred new employees have been added. Subsequently, administrative capabilities have been augmented as required by expanding program responsibilities. By the end of FY 1968, certain managerial support provided by the Department of Health, Education, and Welfare will be handled internally. Organizational structure has been defined, with regions established and headquarters-field relationships delineated adequately for the present. Procedures for program planning, direction and control have been formulated.

This is not to suggest that the FWPCA transition is complete and the new organization in perfect working order. Some problems remain, but the difficult initial adjustment period is now past. The need for new arrangements and procedures to fill gaps and promote efficiency and economy will receive constant attention. The administrative strength of FWPCA's regional components will be raised. Personnel matters are high on the agenda. Scientific and technical personnel must be added constantly. Professionals to deal with the social, economic and administrative aspects of pollution control must also be sought. Generally, the FWPCA staff capacities will be upgraded through various training and development activities. Hopefully, the additional numbered supergrade positions so vitally needed will be secured.

The costs estimated below include those for overall direction (Office of the Commissioner), regional directors, program planning and development, public information, legislative liaison, and administrative services such as financial, personnel, and facilities management. Other support elements, such as library services, communications and transportation are also included.

	COSTS (Thousands)
FY 1969	$ 5,246
1970	5,900
1971	6,200
1972	6,500
1973	6,800
TOTAL	$30,646

NATIONAL REQUIREMENTS AND COST ESTIMATE STUDY

(SECTION 16(a), FEDERAL WATER POLLUTION CONTROL ACT)

As stipulated in Section 16(a), assessment of the nation's needs and related costs involved in controlling pollution from municipal, industrial, agricultural, mining, and other sources is essential to national policy-making. Information has not been readily available in the past to perform such an assessment adequately. Even at this point, there is an urgent need to develop analytical tools and evaluation methods to facilitate a better understanding of the national needs and related issues.

The initial report, "The Cost of Clean Water," was submitted to the Congress in January 1968. This marks the first comprehensive effort by the Federal Government to assess the cost of the national water pollution control program in terms of bringing water quality up to the standards established pursuant to the Water Quality Act of 1965.

If the annual, updated reports are to have maximum utility, information gaps regarding needs and costs must be filled. Accordingly, as future reports are issued, the amount and reliability of the data will be improved with the introduction of actual State-approved water quality standards. Information exchange with State and local planning agencies will be encouraged as will exchange of program related information from other Federal agencies. Better methods will be sought to evaluate progress, re-examine goals, needs and objectives, sharpen projections, and assess

progress and benefits. Participation of industry, university, and non-profit organizations will be encouraged through contractual means to stimulate the highest quality professional interest in this important national problem solution.

Investigations and evaluations will continue to be pursued across the range of this section's interests. These include: (1) a detailed estimate of the cost of carrying out the provisions of the Act (Section 16(a) provides for preparation of this present report. This report is prepared as a normal administrative effort and therefore, not specifically funded in this section.); (2) a comprehensive study of the economic impact on affected units of government of the cost of installing waste treatment facilities; and (3) a comprehensive analysis of the national requirements for and the cost of treating municipal, industrial, and other effluent to attain established water quality standards.

The assessment of national requirements and costs must be the basis for shaping as well as for evaluating FWPCA's operational programs. As such, the projected expenditures in economic and related analyses are expected to be a sound investment eventually showing the way to more effective methods of doing business.

The costs for conducting further analyses and investigations are expected to be:

	COSTS (Thousands)
FY 1969	$ 202
1970	300
1971	300
1972	300
1973	300
TOTAL	$1,402

MANPOWER AND TRAINING NEEDS

(SECTION 16(b), FEDERAL WATER POLLUTION CONTROL ACT)

Section 16(b) directed the Secretary of the Interior to make a complete investigation and study to determine: (1) the need for additional trained State and local personnel to carry out programs assisted pursuant to the Act and other programs for the same purpose as the Act; and (2) the means of using existing Federal training programs to train such personnel.

The report on the findings of the investigation was submitted to the Congress in June 1967, has been published as "Manpower and Training Needs in Water Pollution Control" (Senate Document No. 49, 90th Congress, 1st Session), and is described under Section 5. Its findings are currently being implemented.

WASTE FROM WATERCRAFT

(SECTION 17, FEDERAL WATER POLLUTION CONTROL ACT)

Section 17 authorized a study of the pollution of navigable waters by watercraft, to be submitted to Congress by July 1, 1967.

This study, "Waste from Watercraft" (Senate Document No. 48, 90th Congress, 1st Session), has been reported to the Congress. Since the work authorized by the section has been concluded, no further study costs will ensue. Based on the evidence and conclusions in the report, legislation establishing a comprehensive program for combating pollution from this source was developed and has been introduced as companion Administration bills, S. 2525 and H.R. 13923. The bills have been referred to the respective committees on Public Works. Congressional approval is hoped for in the Second Session, 90th Congress.

It should be noted, however, that FWPCA is already involved in vessel pollution problems under other parts of the Act, albeit in a limited way. Technical assistance and research costs,

pertaining to work on vessel pollution, have been included in Section 5.

INDUSTRIAL INCENTIVES

(SECTION 18, FEDERAL WATER POLLUTION CONTROL ACT)

Section 18 directs the Secretary of the Interior to investigate fully methods for providing incentives which would encourage industry to construct pollution reduction and abatement facilities and to report the results of such investigation, together with his recommendations, to the Congress not later than January 30, 1968.

Since the study has been completed, there will be no additional costs to carry out this provision of the Act.